**WEEK-2**

**PL/SQL, JUnit\_Basic Testing,Mockito exercises &**

**SL4 Logging**

PL-SQL

**Exercise 1: Control Structures**

**Scenario 1:** The bank wants to apply a discount to loan interest rates for customers above 60 years old.

* + **Question:** Write a PL/SQL block that loops through all customers, checks their age, and if they are above 60, apply a 1% discount to their current loan interest rates.

**Scenario 2:** A customer can be promoted to VIP status based on their balance.

* + **Question:** Write a PL/SQL block that iterates through all customers and sets a flag Is VIP to TRUE for those with a balance over $10,000.

**Scenario 3:** The bank wants to send reminders to customers whose loans are due within the next 30 days.

* + **Question:** Write a PL/SQL block that fetches all loans due in the next 30 days and prints a reminder message for each customer.

**CODE:**

SET SERVEROUTPUT ON;

BEGIN

EXECUTE IMMEDIATE 'DROP TABLE loans';

EXCEPTION WHEN OTHERS THEN NULL;

END;

/

BEGIN

EXECUTE IMMEDIATE 'DROP TABLE customers';

EXCEPTION WHEN OTHERS THEN NULL;

END;

/

CREATE TABLE customers (

cust\_id NUMBER PRIMARY KEY,

age NUMBER,

balance NUMBER,

vip\_flag VARCHAR2(5)

);

CREATE TABLE loans (

loan\_id NUMBER PRIMARY KEY,

cust\_id NUMBER,

int\_rate NUMBER,

due\_on DATE,

FOREIGN KEY (cust\_id) REFERENCES customers(cust\_id)

);

INSERT INTO customers VALUES (1, 65, 12000, 'FALSE');

INSERT INTO customers VALUES (2, 45, 8000, 'FALSE');

INSERT INTO customers VALUES (3, 70, 15000, 'FALSE');

INSERT INTO loans VALUES (101, 1, 10, TO\_DATE('04-JUL-2025','DD-MON-YYYY'));

INSERT INTO loans VALUES (102, 2, 9, TO\_DATE('01-SEP-2025','DD-MON-YYYY'));

INSERT INTO loans VALUES (103, 3, 8, TO\_DATE('29-JUN-2025','DD-MON-YYYY'));

COMMIT;

BEGIN

FOR loan\_rec IN (

SELECT l.loan\_id, l.cust\_id, l.int\_rate

FROM loans l

JOIN customers c ON l.cust\_id = c.cust\_id

WHERE c.age > 60

)

LOOP

UPDATE loans

SET int\_rate = int\_rate - 1

WHERE loan\_id = loan\_rec.loan\_id;

DBMS\_OUTPUT.PUT\_LINE(

'Scenario 1: 1% interest discount applied on Loan ' || loan\_rec.loan\_id ||

' (Customer ID ' || loan\_rec.cust\_id || ')'

);

END LOOP;

FOR cust\_rec IN (

SELECT cust\_id, balance FROM customers

WHERE balance > 10000

)

LOOP

UPDATE customers

SET vip\_flag = 'TRUE'

WHERE cust\_id = cust\_rec.cust\_id;

DBMS\_OUTPUT.PUT\_LINE(

' Scenario 2: VIP status set for Customer ' || cust\_rec.cust\_id ||

' (Balance: $' || cust\_rec.balance || ')'

);

END LOOP;

FOR due\_rec IN (

SELECT loan\_id, cust\_id, due\_on

FROM loans

WHERE due\_on BETWEEN SYSDATE AND SYSDATE + 30

)

LOOP

DBMS\_OUTPUT.PUT\_LINE(

'Scenario 3: Reminder - Loan ' || due\_rec.loan\_id ||

' for Customer ' || due\_rec.cust\_id ||

' is due on ' || TO\_CHAR(due\_rec.due\_on, 'DD-MON-YYYY')

);

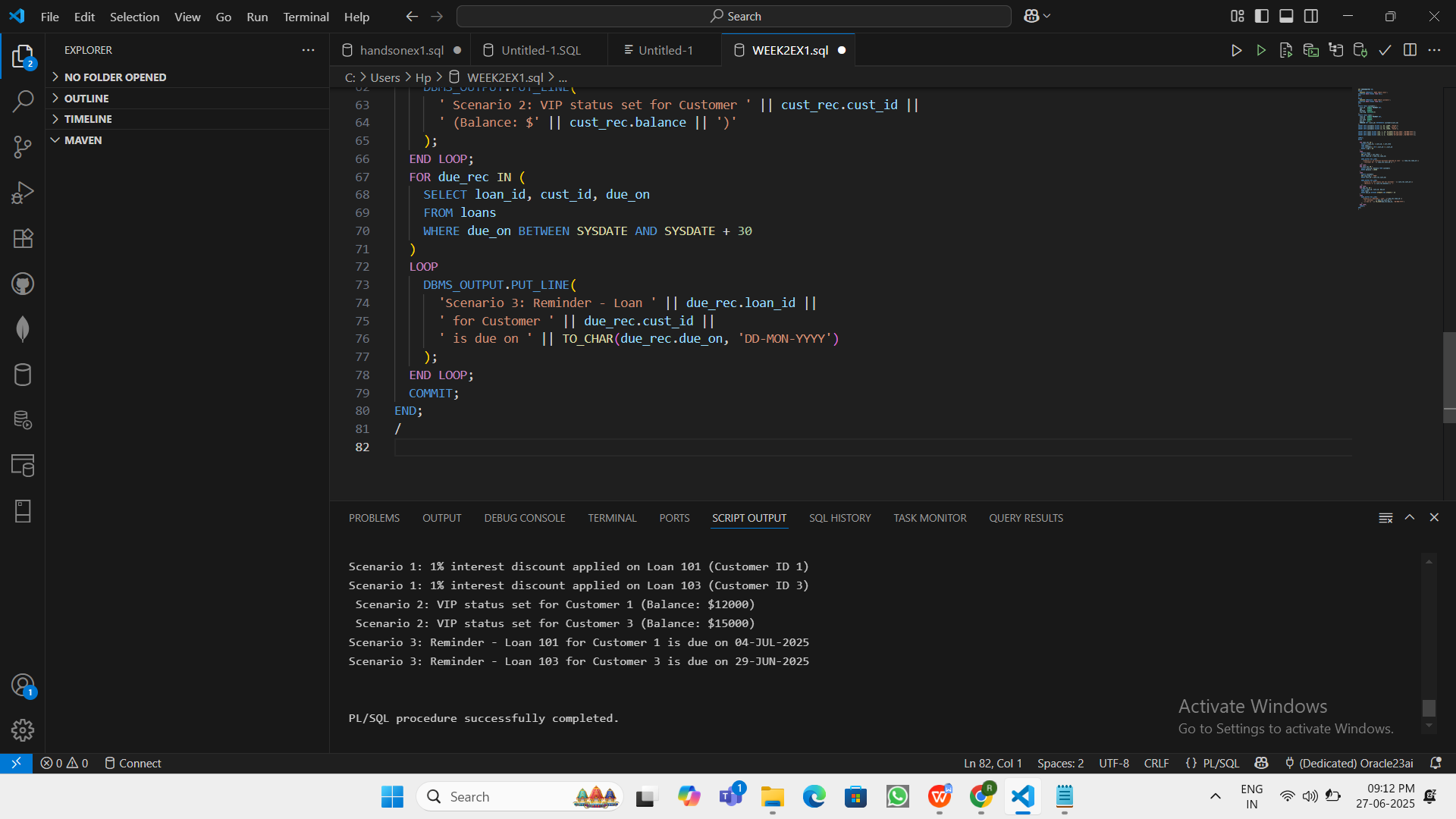
END LOOP;

COMMIT;

END;

/

**OUTPUT:**



Scenario 1: 1% interest discount applied on Loan 101 (Customer ID 1)

Scenario 1: 1% interest discount applied on Loan 103 (Customer ID 3)

Scenario 2: VIP status set for Customer 1 (Balance: $12000)

Scenario 2: VIP status set for Customer 3 (Balance: $15000)

Scenario 3: Reminder - Loan 101 for Customer 1 is due on 04-JUL-2025

Scenario 3: Reminder - Loan 103 for Customer 3 is due on 29-JUN-2025

PL/SQL procedure successfully completed.

**Exercise 3: Stored Procedures**

**Scenario 1:** The bank needs to process monthly interest for all savings accounts.

* + **Question:** Write a stored procedure **ProcessMonthlyInterest** that calculates and updates the balance of all savings accounts by applying an interest rate of 1% to the current balance.

**Scenario 2:** The bank wants to implement a bonus scheme for employees based on their performance.

* + **Question:** Write a stored procedure **UpdateEmployeeBonus** that updates the salary of employees in a given department by adding a bonus percentage passed as a parameter.

**Scenario 3:** Customers should be able to transfer funds between their accounts.

* + **Question:** Write a stored procedure **TransferFunds** that transfers a specified amount from one account to another, checking that the source account has sufficient balance before making the transfer.

**CODE:**

SET SERVEROUTPUT ON;

BEGIN

EXECUTE IMMEDIATE 'DROP TABLE accounts';

EXCEPTION WHEN OTHERS THEN NULL;

END;

/

BEGIN

EXECUTE IMMEDIATE 'DROP TABLE employees';

EXCEPTION WHEN OTHERS THEN NULL;

END;

/

CREATE TABLE accounts (

account\_id NUMBER PRIMARY KEY,

customer\_id NUMBER,

balance NUMBER,

account\_type VARCHAR2(20)

);

CREATE TABLE employees (

emp\_id NUMBER PRIMARY KEY,

name VARCHAR2(50),

department VARCHAR2(50),

salary NUMBER

);

INSERT INTO accounts VALUES (101, 1, 10000, 'SAVINGS');

INSERT INTO accounts VALUES (102, 2, 15000, 'CURRENT');

INSERT INTO accounts VALUES (103, 3, 20000, 'SAVINGS');

INSERT INTO employees VALUES (1, 'Ravi', 'Sales', 40000);

INSERT INTO employees VALUES (2, 'Sneha', 'Finance', 45000);

INSERT INTO employees VALUES (3, 'Ajith', 'Sales', 42000);

COMMIT;

CREATE OR REPLACE PROCEDURE ProcessMonthlyInterest IS

BEGIN

UPDATE accounts

SET balance = balance + (balance \* 0.01)

WHERE UPPER(account\_type) = 'SAVINGS';

DBMS\_OUTPUT.PUT\_LINE('Interest applied to all savings accounts.');

COMMIT;

END;

/

CREATE OR REPLACE PROCEDURE UpdateEmployeeBonus (

p\_dept IN VARCHAR2,

p\_bonus\_pct IN NUMBER

) IS

BEGIN

UPDATE employees

SET salary = salary + (salary \* p\_bonus\_pct / 100)

WHERE LOWER(department) = LOWER(p\_dept);

DBMS\_OUTPUT.PUT\_LINE('Bonus of ' || p\_bonus\_pct || '% applied to ' || p\_dept || ' department.');

COMMIT;

END;

/

CREATE OR REPLACE PROCEDURE TransferFunds (

p\_from\_account IN NUMBER,

p\_to\_account IN NUMBER,

p\_amount IN NUMBER

) IS

v\_balance NUMBER;

BEGIN

SELECT balance INTO v\_balance

FROM accounts

WHERE account\_id = p\_from\_account;

IF v\_balance < p\_amount THEN

RAISE\_APPLICATION\_ERROR(-20001, 'Not enough balance in source account.');

END IF;

UPDATE accounts

SET balance = balance - p\_amount

WHERE account\_id = p\_from\_account;

UPDATE accounts

SET balance = balance + p\_amount

WHERE account\_id = p\_to\_account;

DBMS\_OUTPUT.PUT\_LINE('₹' || p\_amount || ' transferred from Account ' || p\_from\_account || ' to Account ' || p\_to\_account);

COMMIT;

END;

/

BEGIN

DBMS\_OUTPUT.PUT\_LINE('----- Executing ProcessMonthlyInterest -----');

ProcessMonthlyInterest;

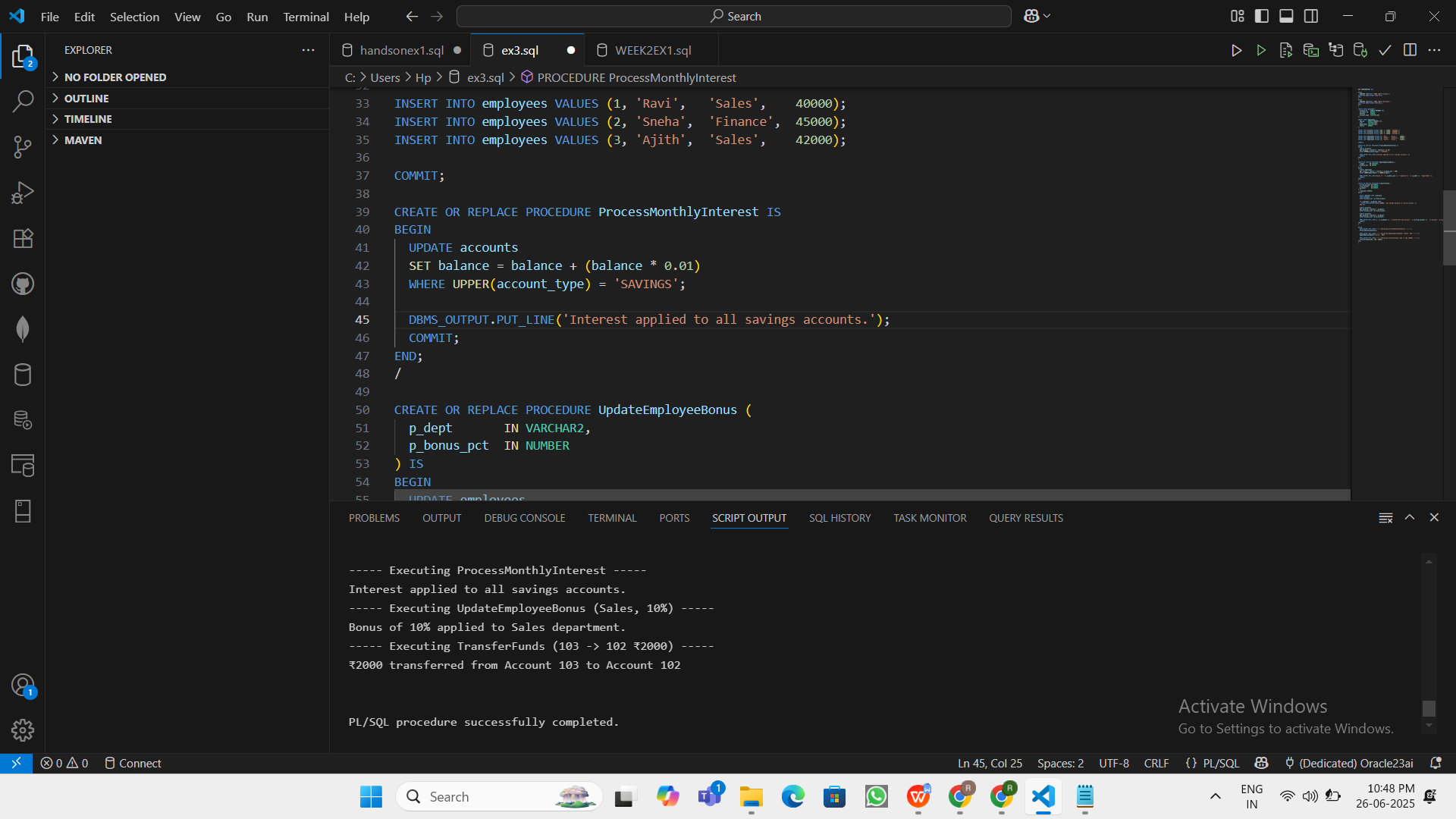
DBMS\_OUTPUT.PUT\_LINE('----- Executing UpdateEmployeeBonus (Sales, 10%) -----');

UpdateEmployeeBonus('Sales', 10);

DBMS\_OUTPUT.PUT\_LINE('----- Executing TransferFunds (103 -> 102 ₹2000) -----');

TransferFunds(103, 102, 2000);

END;

**OUTPUT**

**JUnit Basic Testing**

**Exercise 1: Setting Up JUnit**

**Scenario:**

You need to set up JUnit in your Java project to start writing unit tests.

**Steps:**

1. Create a new Java project in your IDE (e.g., IntelliJ IDEA, Eclipse).

2. Add JUnit dependency to your project. If you are using Maven, add the following to your

pom.xml:

<dependency>

<groupId>junit</groupId>

<artifactId>junit</artifactId>

<version>4.13.2</version>

<scope>test</scope>

</dependency>

3. Create a new test class in your project

**CODE:**

**Calculator.java**

package com.example;

public class Calculator {

public int add(int a, int b) {

System.out.println("Adding numbers: " + a + " + " + b);

int result = a + b;

System.out.println("Computed result: " + result);

return result;

}

public int subtract(int a, int b) {

System.out.println("Subtracting numbers: " + a + " - " + b);

int result = a - b;

System.out.println("Computed result: " + result);

return result;

}

public int multiply(int a, int b) {

System.out.println("Multiplying numbers: " + a + " \* " + b);

int result = a \* b;

System.out.println("Computed result: " + result);

return result;

}

}

**CalculatorTest.java**

package com.example;

import org.junit.Test;

import static org.junit.Assert.\*;

public class CalculatorTest {

@Test

public void testAdd() {

Calculator calc = new Calculator();

System.out.println("---- Testing add() ----");

int result = calc.add(2, 3);

assertEquals(5, result);

System.out.println("Test add() passed.\n");

}

@Test

public void testSubtract() {

Calculator calc = new Calculator();

System.out.println("---- Testing subtract() ----");

int result = calc.subtract(10, 4);

assertEquals(6, result);

System.out.println("Test subtract() passed.\n");

}

@Test

public void testMultiply() {

Calculator calc = new Calculator();

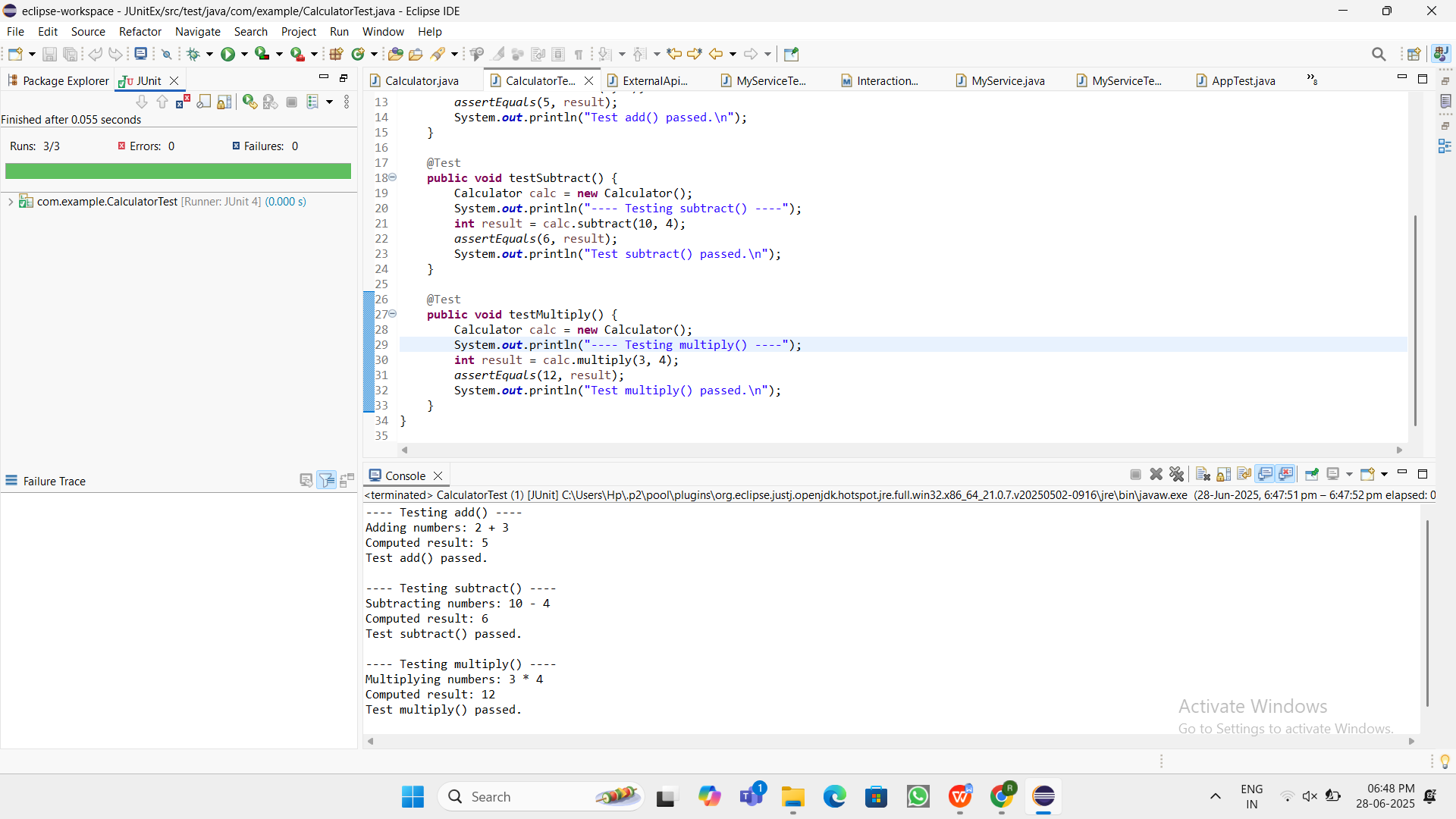
System.out.println("---- Testing multiply() ----");

int result = calc.multiply(3, 4);

assertEquals(12, result);

System.out.println("Test multiply() passed.\n");

**OUTPUT:**



**Exercise 3: Assertions in JUnit**

**Scenario:**

You need to use different assertions in JUnit to validate your test results.

Steps: 1. Write tests using various JUnit assertions.

**Solution Code:**

public class AssertionsTest {

@Test

public void testAssertions() {

// Assert equals

assertEquals(5, 2 + 3);

// Assert true

assertTrue(5 > 3);

// Assert false

assertFalse(5 < 3);

// Assert null

assertNull(null);

// Assert not null

assertNotNull(new Object());

}

}

**CODE:**

**AssertionsTest.java**

package com.example;

import org.junit.Test;

import static org.junit.Assert.\*;

public class AssertionsTest {

@Test

public void testAssertions() {

assertEquals(5, 2 + 3);

System.out.println("assertEquals passed");

assertTrue(5 > 3);

System.out.println("assertTrue passed");

assertFalse(5 < 3);

System.out.println("assertFalse passed");

assertNull(null);

System.out.println("assertNull passed");

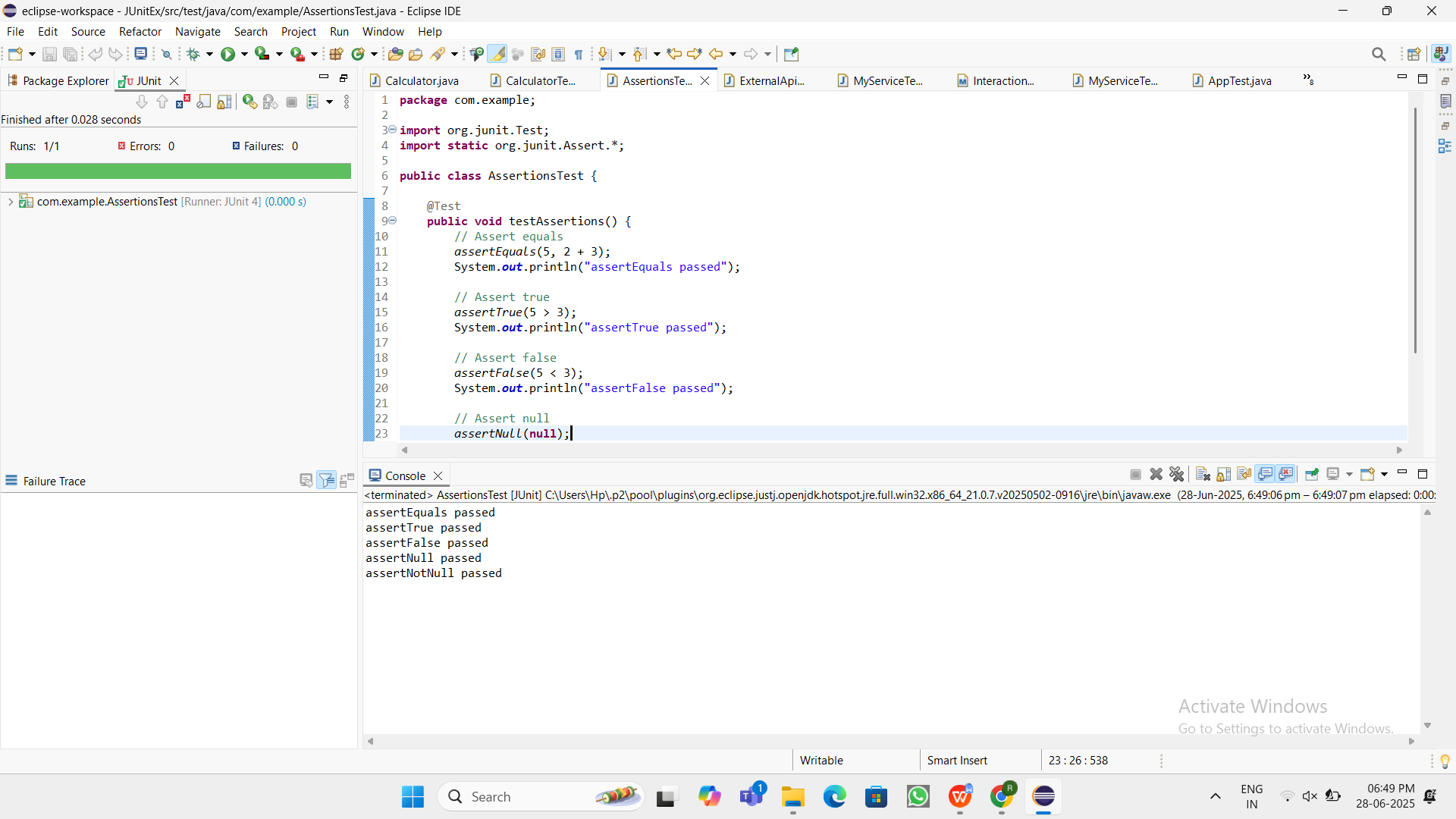
assertNotNull(new Object());

System.out.println("assertNotNull passed");

}

}

**OUTPUT:**



**Exercise 4: Arrange-Act-Assert (AAA) Pattern, Test Fixtures, Setup and Teardown Methods in JUnit**

**Scenario:**

You need to organize your tests using the Arrange-Act-Assert (AAA) pattern and use setup

and teardown methods.

**Steps:**

1. Write tests using the AAA pattern.

2. Use @Before and @After annotations for setup and teardown methods.

**CODE:**

**CalculatorTestAAA.java**

package com.example;

import org.junit.Before;

import org.junit.After;

import org.junit.Test;

import static org.junit.Assert.\*;

public class CalculatorTestAAA {

private Calculator calculator;

@Before

public void setUp() {

calculator = new Calculator();

System.out.println("setUp: Calculator instance created");

}

@After

public void tearDown() {

System.out.println("tearDown: Test completed\n");

}@Test

public void testAddition() {

int a = 10;

int b = 5;

int result = calculator.add(a, b);

assertEquals(15, result);

System.out.println("testAddition: " + a + " + " + b + " = " + result);

}

@Test

public void testSubtraction() {

int a = 8;

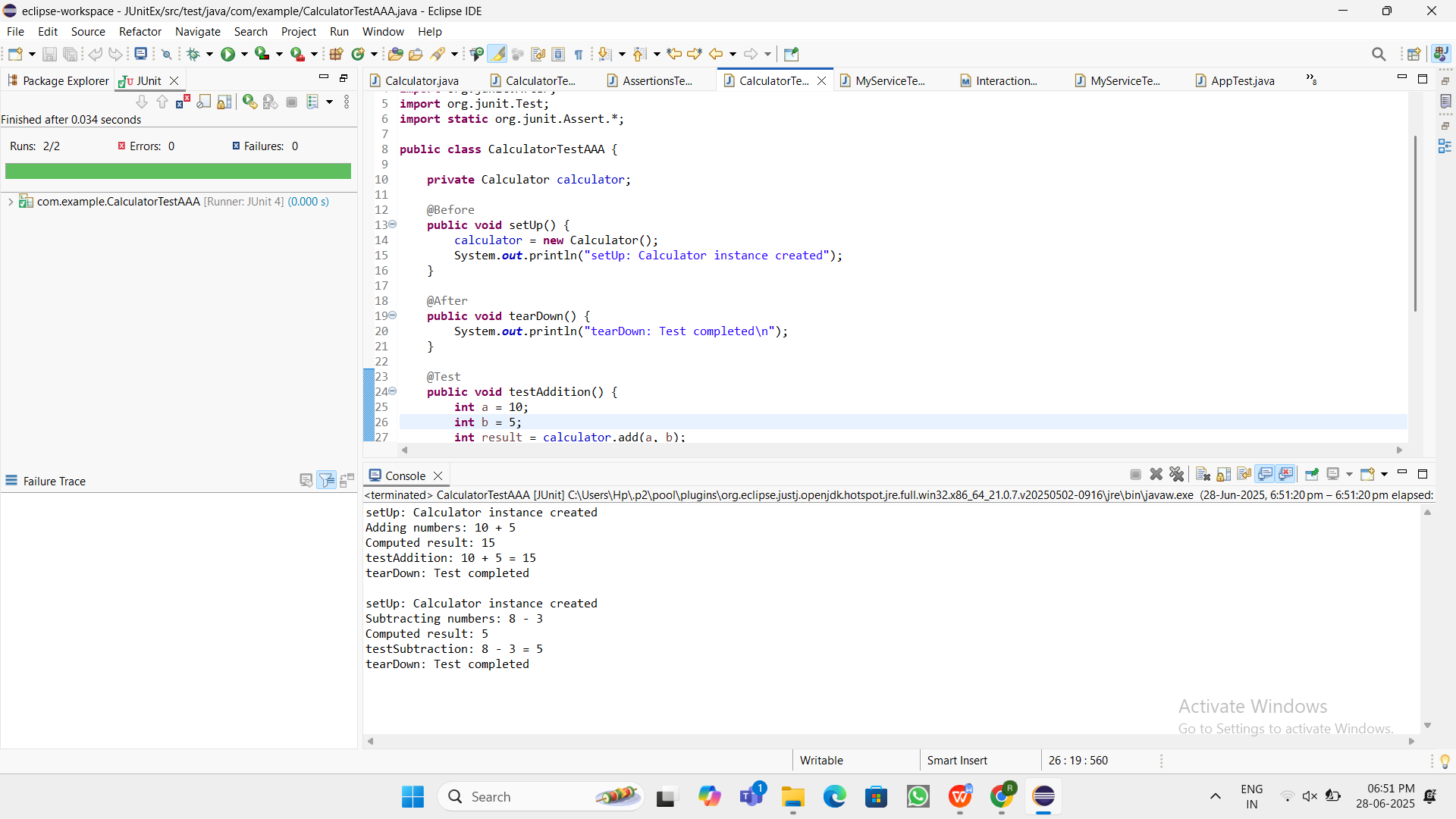
int b = 3;

int result = calculator.subtract(a, b);

assertEquals(5, result);

System.out.println("testSubtraction: " + a + " - " + b + " = " + result);

}

**OUTPUT:**

**Mockito Hands-On Exercises**

**Exercise 1: Mocking and Stubbing**

**Scenario:**

You need to test a service that depends on an external API. Use Mockito to mock the

external API and stub its methods.

**Steps:**

1. Create a mock object for the external API.

2. Stub the methods to return predefined values.

3. Write a test case that uses the mock object.

Solution Code:

import static org.mockito.Mockito.\*;

import org.junit.jupiter.api.Test;

import org.mockito.Mockito;

public class MyServiceTest {

@Test

public void testExternalApi() {

ExternalApi mockApi = Mockito.mock(ExternalApi.class);

when(mockApi.getData()).thenReturn("Mock Data");

MyService service = new MyService(mockApi);

String result = service.fetchData();

assertEquals("Mock Data", result);

}

**CODE:**

**ExternalApi.java**

package com.example.MockDemo;

public interface ExternalApi {

String getData();

}

**Myservice.java**

package com.example.MockDemo;

public class MyService {

private final ExternalApi externalApi;

public MyService(ExternalApi externalApi) {

this.externalApi = externalApi;

}

public String fetchData() {

return externalApi.getData();

}

}

**MyServiceTest.java**

package com.example.MockDemo;

import org.junit.jupiter.api.Test;

import static org.junit.jupiter.api.Assertions.assertEquals;

import static org.mockito.Mockito.\*;

public class MyServiceTest {

@Test

public void testFetchData() {

// Arrange (Mock setup)

ExternalApi mockApi = mock(ExternalApi.class);

when(mockApi.getData()).thenReturn("Mock Data");

MyService service = new MyService(mockApi);

String result = service.fetchData();

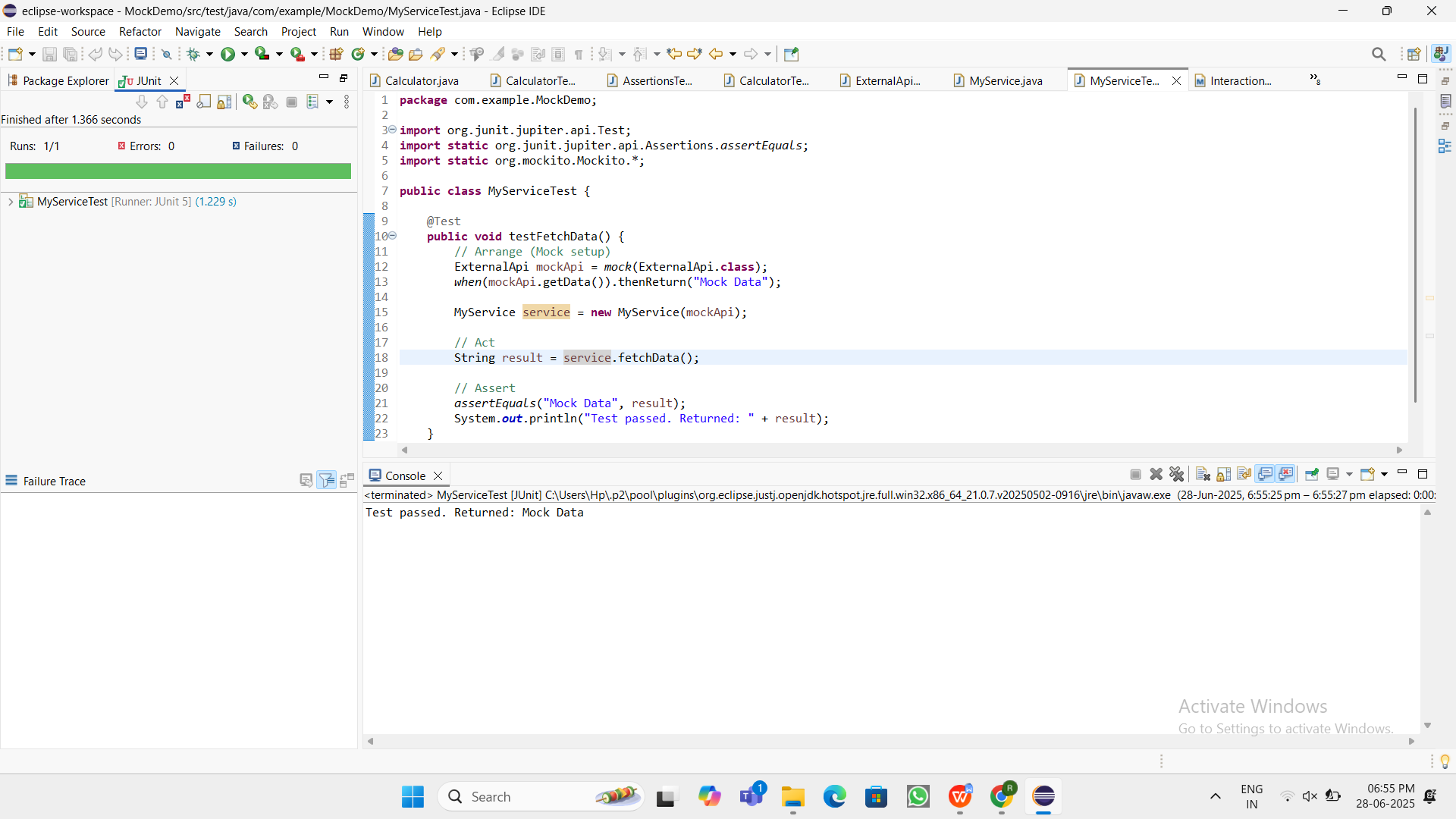
assertEquals("Mock Data", result);

System.out.println("Test passed. Returned: " + result);

}

}

**OUTPUT:**



**Exercise 2: Verifying Interactions**

**Scenario:**

You need to ensure that a method is called with specific arguments.

**Steps:**

1. Create a mock object.

2. Call the method with specific arguments.

3. Verify the interaction.

Solution Code:

import static org.mockito.Mockito.\*; import org.junit.jupiter.api.Test;

import org.mockito.Mockito;

public class MyServiceTest {

@Test

public void testVerifyInteraction() {

ExternalApi mockApi = Mockito.mock(ExternalApi.class);

MyService service = new MyService(mockApi);

service.fetchData();

verify(mockApi).getData();

**CODE:**

**ExternalApi.java**

package com.example.InteractionVerifier;

public interface ExternalApi {

String getData();

}

**MyService.java**

package com.example.InteractionVerifier;

public class MyService {

private ExternalApi externalApi;

public MyService(ExternalApi externalApi) {

this.externalApi = externalApi;

}

public String fetchData() {

return externalApi.getData();

}

}

**MyServiceTest.java**

package com.example.InteractionVerifier;

import org.junit.jupiter.api.Test;

import static org.junit.jupiter.api.Assertions.assertEquals;

import static org.mockito.Mockito.\*;

public class MyServiceTest {

@Test

public void testVerifyInteraction() {

ExternalApi mockApi = mock(ExternalApi.class);

when(mockApi.getData()).thenReturn("Mocked Interaction Data");

MyService service = new MyService(mockApi);

String result = service.fetchData();

assertEquals("Mocked Interaction Data", result);

System.out.println("fetchData() returned: " + result);

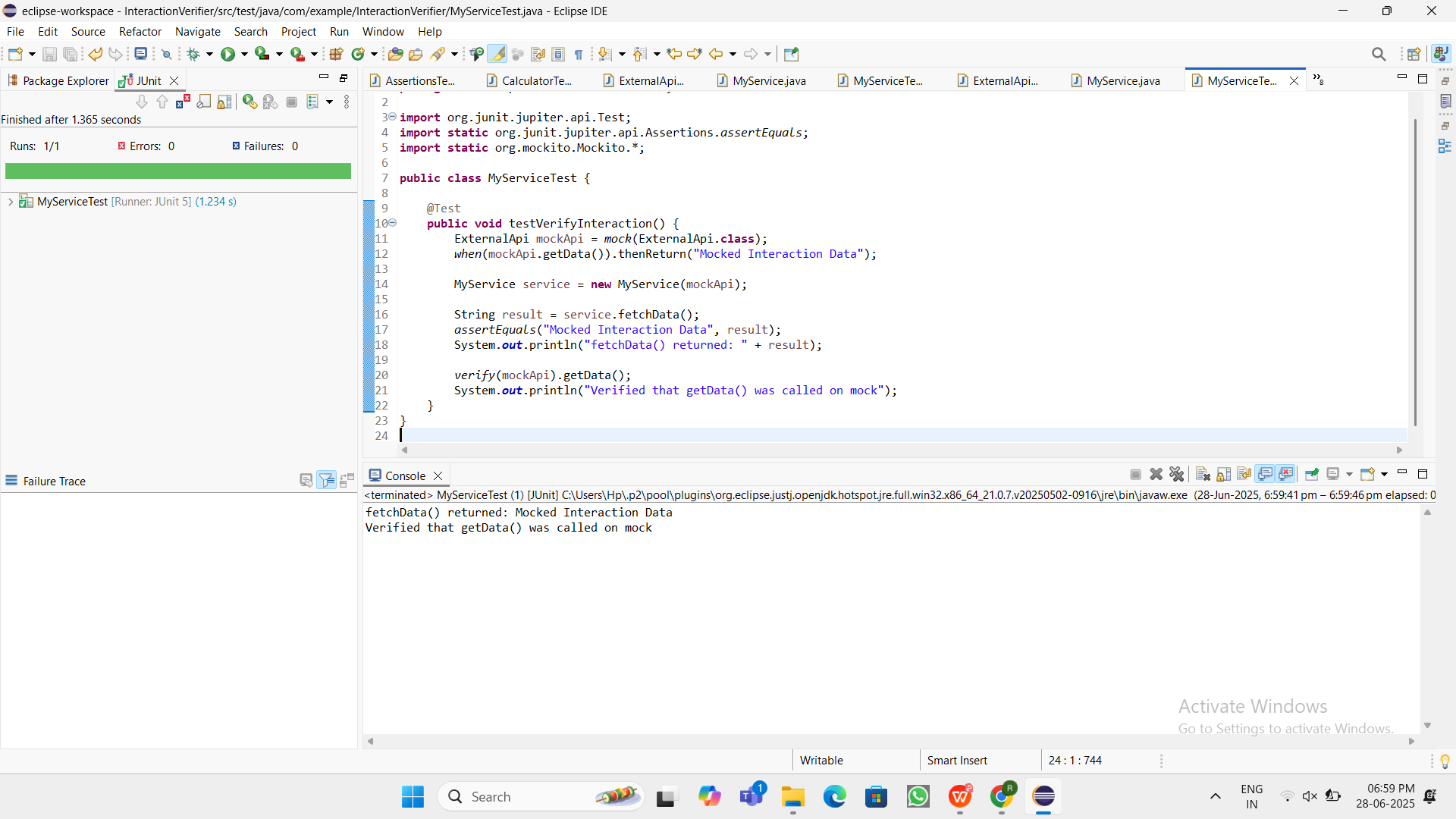
verify(mockApi).getData();

System.out.println("Verified that getData() was called on mock");

}

}

**OUTPUT:**



**Logging using SLF4J**

**Exercise 1: Logging Error Messages and Warning Levels**

**Task:** Write a Java application that demonstrates logging error messages and warning levels

using SLF4J.

Step-by-Step Solution:

1. Add SLF4J and Logback dependencies to your `pom.xml` file:

<dependency>

<groupId>org.slf4j</groupId>

<artifactId>slf4j-api</artifactId>

<version>1.7.30</version>

</dependency>

<dependency>

<groupId>ch.qos.logback</groupId>

<artifactId>logback-classic</artifactId>

<version>1.2.3</version>

</dependency>

2. Create a Java class that uses SLF4J for logging:

import org.slf4j.Logger;

import org.slf4j.LoggerFactory;

public class LoggingExample {

private static final Logger logger = LoggerFactory.getLogger(LoggingExample.class);

public static void main(String[] args) {

logger.error("This is an error message");

logger.warn("This is a warning message");

}

}

**CODE:**

**LoggingExample.java**

package com.example.LoggingDemonew;

import org.slf4j.Logger;

import org.slf4j.LoggerFactory;

public class LoggingExample {

private static final Logger logger = LoggerFactory.getLogger(LoggingExample.class);

public static void main(String[] args) {

logger.error("This is an ERROR message");

logger.warn("This is a WARNING message");

logger.info("This is an INFO message");

logger.debug("This is a DEBUG message");

}

}

**OUTPUT:**

